

# Developing an Online Training on the Ship Safety Manual for Pearl Harbor Naval Shipyard

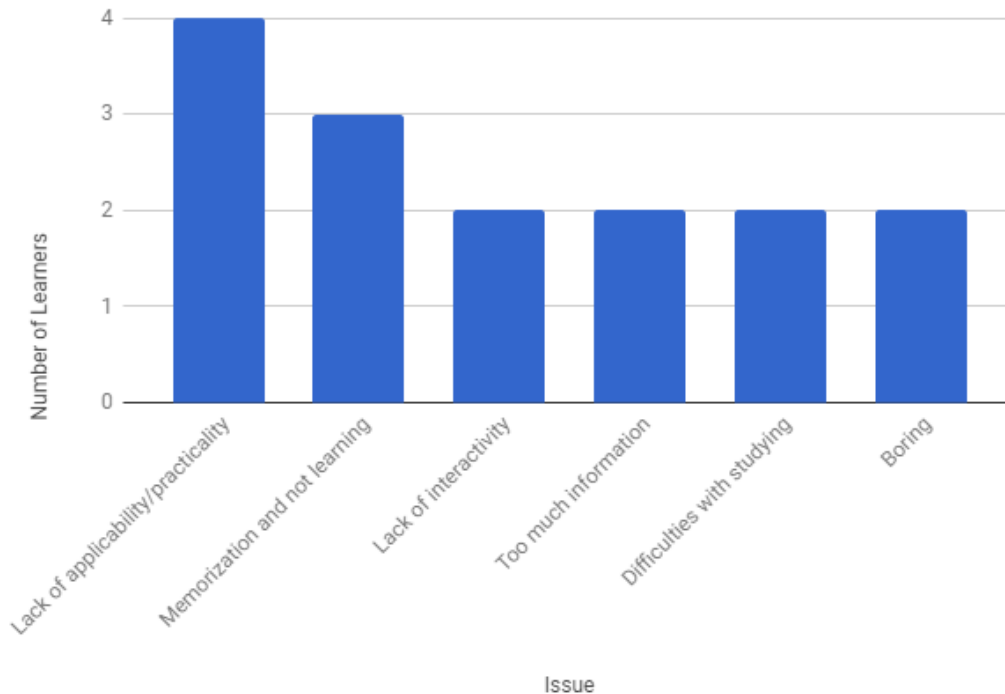
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**Abstract:** At Pearl Harbor Naval Shipyard, the Ship Safety Manual sets important guidelines for keeping equipment and personnel safe. Shipyard engineers must be trained in these guidelines, but the current instruction fails to keep its learners engaged. The purpose of this instructional design project was to explore using an online instruction to teach the Ship Safety Manual to engineers at the Shipyard. This online instruction consisted of text-based modules that utilized figures, practice quizzes, and discussion boards on the website Canvas. It also incorporated interactivity and allowed learners to learn at their own pace. Participants were Shipyard engineers who were required to be trained in the Ship Safety Manual. A total of 12 participants volunteered and completed a pre-test, the online instruction, a post-test, and an instruction evaluation in that order. They could complete these components at their own pace within a four-week period. While pre-test scores ranged from 9% to 92%, post-test scores ranged from 56% to 100%. The most improvement was seen from participants with two or less years of experience at the Shipyard. In terms of confidence, 11 out of 12 experienced an increase in confidence level. The online instruction was able to increase both test scores and confidence in the participants, especially for those with less work experience. However, the scores of new employees did not meet Shipyard standards. Therefore, the online instruction seems better suited to be a refresher tool for current employees rather than a training tool for new hires.

## Introduction

At Pearl Harbor Naval Shipyard, the Ship Safety Manual sets important guidelines for keeping equipment and personnel safe while submarines are undergoing maintenance. Shipyard engineers must be trained in these Ship Safety guidelines, but the current instruction fails to keep its learners engaged. The current instruction is conducted through slideshows and lectures, and learners are allowed time to study printouts of the slides on their own or with each other. Unfortunately, for most learners who are unfamiliar with submarines and the Shipyard's maintenance procedures, the sudden barrage of information, presented in such a dry manner, can be both overwhelming and difficult to process. While learners may be able to pass the training by simply memorizing information for the test, it does not help them understand the lessons necessary to perform their jobs safely.

Twelve participants were asked what they disliked about the current instruction, and their responses showed several common issues, as shown in Figure 1. The most common issue was that the training lacked applicability and practicality to their actual jobs. Another common issue was that the training promoted memorization instead of learning. One participant mentioned that the training “can resemble an assembly line for blind instruction-followers”; another said that “it is easier to memorize to pass a test with the allowed time to study than to work on learning the subject matter”.



**Figure 1.** Common issues with current training program.

The purpose of this instructional design project was to explore using an online instruction to teach the Ship Safety manual to engineers at the Shipyard. This online instruction consisted of text-based modules that utilized figures, along with non-graded practice quizzes after each module. Unlike the current instruction, the online instruction promoted interactivity, and learners set their own pace as they worked through the modules. The text-based modules, unlike the lectures and slides, utilized a conversational tone and explained Shipyard terms that learners may not be familiar with. In addition, the practice quizzes allowed learners to review what they have just covered, and discussion boards allowed learners to collaborate with each other. By implementing this online instruction, this research would reveal the impact that it has and its feasibility as a method of workplace training.

## Literature Review

The primary source of information for the online instruction content came from the United States Navy’s Ship Safety Manual (2009). The Navy also offered an additional

guide that depicted safe working practices during ship availabilities (2008). The last bit of instruction content were the figures, some of which were retrieved from the Navy's online photo gallery (2017).

For literature dealing with workplace training, Nilson's "How to manage training" (2007) was aimed towards managers who planned to facilitate training for their workers in a self-directed course. It showed the key elements that training materials need to be successful in the workplace, such as "meeting your customers' needs" or understanding what the trainees' jobs are to train them properly, adapting the training to fit multiple learning styles, and "nurturing" what trainees learned by having them apply it to their jobs (pp. 241-243). These traits were considered in the development of this instructional design project. In addition, Haley's "Online workplace training in libraries" described a study comparing online and face-to-face training preferences for various demographics. It concluded that preferences for online training had no correlation with demographics such as age, ethnicity, gender, or education. This information showed that when evaluating the effectiveness of this instructional design project, other factors besides these demographics should be examined.

There were several recent literatures that explained research regarding workplace training. Detsimas, Coffey, Sadiqi, and Li (2016) conducted research with the construction industry and showed that high training participation did not necessarily lead to learned skills, and that skills are learned through doing. In 2013, Coveney, Switzer, Corrigan, and Redmond performed a study to see if the location of an instruction would help the recollection of information for medical students. For this study, the students received instruction in two different physical environments: a classroom and an operating room. Over the course of the study, researchers concluded that location had no effect on student recollection. This suggests that asynchronous learning will not vary in effectiveness even if it is accessed from various physical locations. Lastly, Vanderzanden (2013) conducted research to evaluate the effectiveness of asynchronous online training modules used to prepare professionals for an industry exam. Over six years with the online training, the pass rate for the exam increased by nearly 30%. Reasons for this success include using technology to personalize learning, create interactive learning exercises, allow immediate quiz feedback, and offering printable notes.

There were many pieces of literature discussing instructional design. Gagné, Wager, Golas, and Keller (2005) wrote a book that introduced the basics of instructional design and the ADDIE model. The ADDIE model consists of analysis (analyze the goals of the instruction), design (design instruction to meet course objectives), development (develop materials and activities), implementation (implement instruction with learners), and evaluation (evaluate instruction and plan revisions). The authors also included a section specific to online learning where they summarized the benefits and challenges of online learning. While online learning is convenient, efficient, flexible, and cost-effective, it also is prone to technological issues, may provide excessive or incorrect information, lacks social contact, and makes it difficult to keep learners motivated (pp. 313-317). Dick and Carey's (2009) book on instructional design provided detailed steps of the instructional

design process. It also included case studies as examples to these steps. The development of this instructional design project used these steps as a guideline.

For literature including educational concepts or theories, Tsai's article (2011) depicted research that positively evaluated the success of a learning system which combined online and in-person education in addition to physical classroom learning theories such as adaptive, collaborative, scaffolding, and scenario learning. In addition, Bradley's paper (2010) discussed the strategy behind the constructivist learning environment to create effective learning. This environment is centered on the learner and requires them to be active participants in discussions. Bradley said that the educational effectiveness of these discussions is determined by the social, cognitive, and teaching presence of the instruction. The social presence works the learners' interactivity, the cognitive presence works their minds, and the teaching presence regulates and balances the other two presences.

### **Project Design**

In developing the online instruction, the focus was to include features that were not possible to include in the current face-to-face training. Click-through modules were used to allow users to learn at their own pace. The modules were text-based with several images and videos that kept users engaged and showed examples of the material. Practice quizzes and discussion boards were included to promote interactivity and collaboration between different users. Unfamiliar terms were emphasized to help new hires understand the material more effectively.

To include these features, the platform Canvas was used to host the instruction. Canvas is a website that allows users to create their own online courses and invite others to complete them for free. Not only did Canvas include the necessary features for this project, it also had a clean and clear user interface that was easy for first-time users to understand. Canvas was also simple for instruction development and distribution.

For this project, the following instruments and their approximate times to completion were used:

- Online instruction (45-60 minutes)
- Pre-test and post-test (10-15 minutes each)
- Instruction evaluation (5 minutes)

Examples of the online instruction can be found in the following appendices: homepage (Appendix A), module list (Appendix B), module page (Appendix C), module quiz (Appendix D), and module discussion board (Appendix E). Examples of the pre-test and post-test can be found in Appendix F. The instruction evaluation is shown in Appendix G.

Before beginning the instruction, participants completed a pre-test to gauge their initial knowledge. This pre-test was 25 questions long and utilized both multiple choice and short answer questions. Immediately after completing the pre-test, participants could see

what the correct answers were, but they could not retake the pre-test. Participants were required to complete the pre-test before they could proceed to the rest of the instruction.

After the pre-test, the instruction was divided into three modules. These modules primarily used text that frequently referenced visual media and examples to assist understanding. Visual media came in the form of simplified diagrams, real-life images, and videos. At the end of each module, participants could complete a practice quiz and participate in the discussion board. The practice quiz consisted of two to five multiple choice questions and could be completed multiple times. The discussion board allowed participants to talk with each other or the instructor about the module's content. Both were meant to increase interactivity and collaboration, and both were optional to complete.

Once participants completed all three modules, they could take the post-test. The post-test included 30 questions, and like the pre-test, these questions were either multiple choice or short answers. Participants could see their answers immediately after completing the post-test, but they could not retake it.

After the post-test, participants were asked to complete the instruction evaluation. The evaluation asked about years of work experience, confidence levels before and after the instruction, and opinions on the current and online instructions.

## **Methods**

This project aimed to answer the following research questions:

1. How does an online instruction affect Ship Safety training test scores for Shipyard engineers?
2. How does an online instruction affect the confidence of Shipyard engineers in Ship Safety training?

Question 1 comes from the perspective of the Shipyard which qualifies engineers based solely on test scores. Engineers must score 75% or higher to qualify for work at the Shipyard. This question was answered by comparing the test scores between the pre-test and the post-test. Question 2 comes from the perspective of Shipyard engineers whose ability to accomplish work is based on their confidence in their knowledge. This was answered by evaluating the data that participants provided in the instruction evaluation after they completed the post-test.

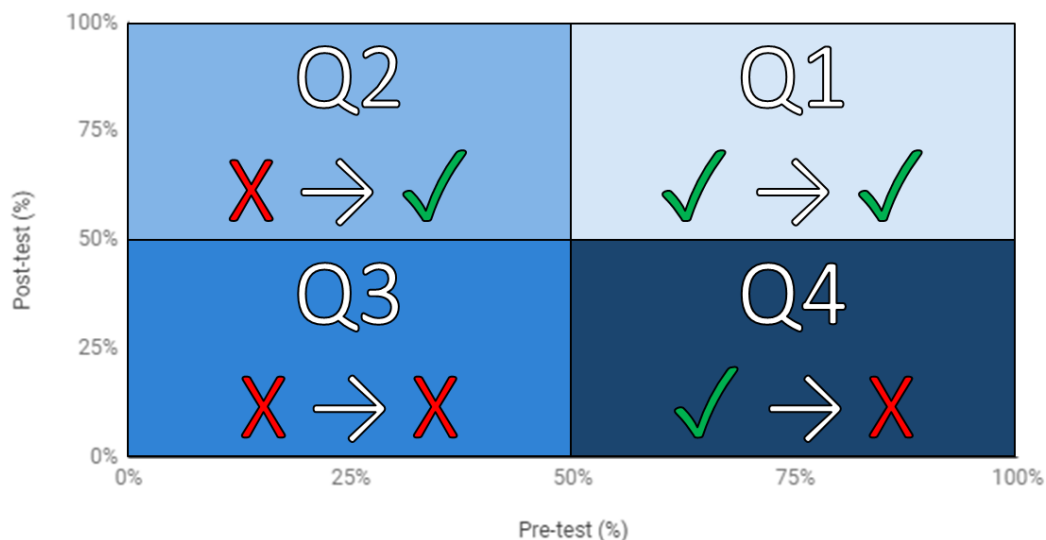
The participants of this project were Shipyard engineers, specifically those who are required to complete the Ship Safety Manual training. A total of 12 participants were recruited over a three-week period, ranging from brand new hires to those with nine years of experience. Recruitment was done through work e-mails using the Google Form shown in Appendix H. Further interaction was done with participants' preferred e-mail addresses. Participants were asked to volunteer a total of approximately 60 to 90 minutes of their time at some point over a four-week period to complete the pre-test, online instruction, post-test, and instruction evaluation. They were also asked to allow the information they provided, aside from their names, to be used for this research.

Participants offered their consent on two occasions, once prior to starting the instruction and once after they completed it. The first was done with an e-mailed consent form where participants could only access the instruction from a link within the form. This consent form can be seen in Appendix I. The second occasion was done as a question on the instruction evaluation.

After the recruitment process, participants were given four weeks to complete the online instruction, tests, and evaluation. They were able to take as long as they wanted to complete these items as long as they did so within the four-week period. In addition, the participants could stop in the middle of the instruction and continue it later.

## Results

The test scores of the 12 participants were compared in a scatter plot comparing pre-test and post-test scores with both values as percentages. This graph can be interpreted using Figure 2 as a guide.



**Figure 2.** The post-test versus pre-test graph divided into quadrants as a guide.

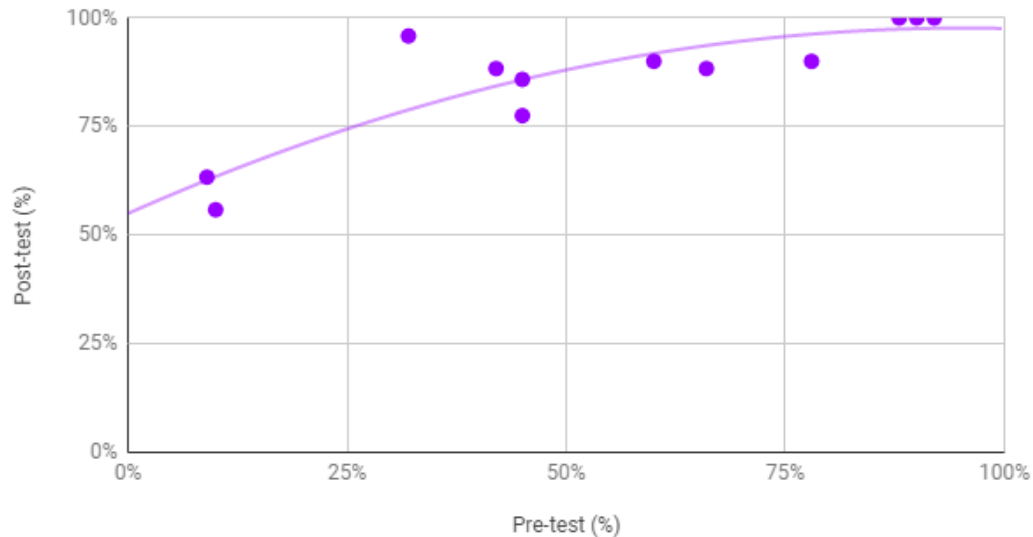
In this figure, the pre-test scores can be divided between the right and left quadrants. On the right, “fair” pre-test scores, or those above 50%, are represented by Q1 and Q4. On the left, “poor” pre-test scores, or those below 50%, are represented by Q2 and Q3. Similarly, the post-test scores can be divided between upper and lower quadrants. “Fair” post-test scores are in Q1 and Q2; “poor” post-test scores are in Q3 and Q4.

When evaluating data points individually, the quadrant that a point is in describes the type of pre-test and post-test scores of that participant in the following way:

- Q1: fair pre-test and fair post-test scores
- Q2: poor pre-test but fair post-test scores
- Q3: poor pre-test and poor post-test scores
- Q4: fair pre-test but poor post-test scores

For this online instruction to be considered effective, most data points would have to be in Q1 and Q2. Q1 would show that participants proficient in the material remained proficient after the instruction. Q2 would show that participants who were initially poor in the material became proficient.

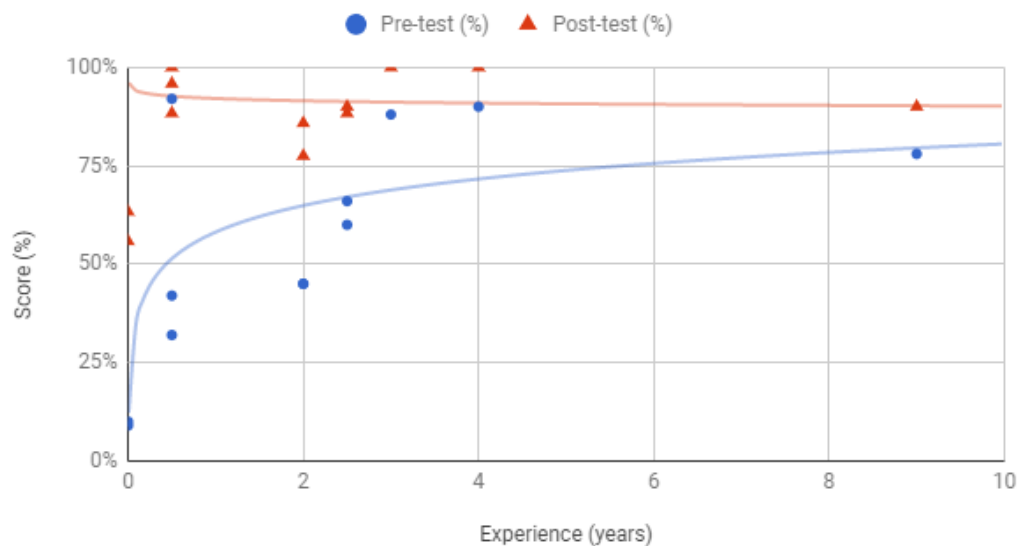
The test scores of the participants were compared in Figure 3.



**Figure 3.** Scatter plot comparing pre-test and post-test scores.

Using Figure 2 as a guide, all data points reside in Q1 and Q2. The pre-test scores of participants ranged from 9% to 92% (poor to fair). However, post-test scores ranged from 56% to 100% (all fair).

The test scores were also evaluated in terms of work experience of the participants, as shown in Figure 4.

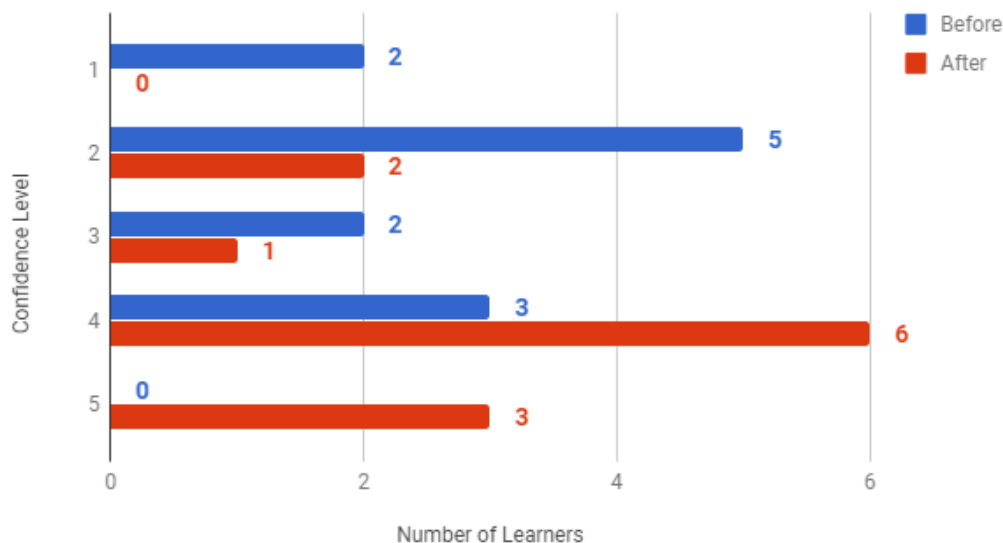


**Figure 4.** Graph comparing test scores and work experience.

The trendlines in this figure show the differences between the pre- and post-test scores based on experience. First, the pre-test trendline shows that those with less experience have significantly lower scores than those with more work experience. In the pre-test, participants with two years or less of work experience scored an average of 39%. Participants with more than two years scored an average of 76%. The post-test trendline is much more consistent over the years of experience. Participants with two years or less experience scored an average of 81%; those with more than two years had an average of 94%.

The trendlines also show a significant difference in improvement between newer and older employees. Participants with two years or less of work experience improved by an average of 42% from the pre-test to the post-test. Those with more than two years of experience improved by an average of 17%.

Finally, participants were asked to rate their levels of confidence in the instruction material before and after completing the online instruction, as shown in Figure 5. The ratings were on a scale of 1 to 5, with 1 being “not confident” and 5 being “very confident”.



**Figure 5.** Bar graph of confidence levels versus number of learners before and after completing the online instruction, with a confidence level of 5 meaning “very confident”.

Prior to completing the instruction, 75% of the participants rated their confidence low, between 1 and 3, and none of them considered themselves to be “very confident”. After completing the instruction, 75% of the participants rated their confidence high, at 4 or 5 with none of the participants considering themselves to be “not confident”. From the participants, 11 out of 12 experienced an increase in confidence level; the remaining one participant experienced no change. In addition, there was no correlation between confidence levels and years of experience.



## Discussion and Conclusions

In the comparison of pre-test and post-test scores, the online instruction was successful in increasing test scores for all participants. In addition, all participants either improved their test scores from poor to fair, or their test scores remained fair. From this analysis, the online instruction can be considered effective in improving test scores.

When taking work experience into account, results showed that participants with two years or less of work experience showed significantly more improvement than those with more than two years of experience. This showed that engineers with less work experience benefited more from the online instruction than those with more work experience. This conclusion also implies that new hires with similar work experience (e.g. former Navy, non-engineering Shipyard jobs) would also see less benefit from an online instruction than new hires with no Shipyard experience.

However, the scores of new employees did not meet the Shipyard requirement of 75% or more. Of the participants, the two that had less than half a year of work experience had post-test scores that did not meet this requirement. This showed that the online instruction may not be effective in training brand-new employees.

When examining confidence, nearly all participants felt more confident in their knowledge after completing the training. In addition, most confidence ratings shifted from low rankings before the instruction to high rankings after the instruction. This showed that the online instruction was effective in improving the participants' confidence in their knowledge.

The online instruction was effective in increasing both test scores and confidence of Shipyard engineers in the Ship Safety Manual. In addition, the test scores of engineers with less work experience improved the most. However, the scores of brand-new employees were unable to meet the requirements of the Shipyard. Therefore, the online instruction seems better suited to be a refresher tool for current employees rather than a training tool for new hires.

As a refresher tool, the online instruction can still benefit current engineers. Re-training current employees is an important factor in keeping employees vigilant in their knowledge and maintaining a safe work environment. In addition, increasing confidence in their knowledge will allow employees to work more efficiently in making decisions regarding the Ship Safety Manual. Furthermore, the online instruction can still be used as a study tool by new hires to accelerate the learning process. While the online instruction may not be able to replace the current training program completely, it is an effective way to improve both learning and safety within the Shipyard.

If the research was to continue, several adjustments to the instruction should be considered. First, recruitment should target participants with more Shipyard work experience. Most participants in this research had four years or less of work experience, and this research would be more informative if it included participants with more

experience. The inclusion of additional participants with more years of Shipyard work experience could build on the evidence showing that the online instruction becomes less effective with more work experience, along with additional data to more accurately calculate when the instruction becomes ineffective.

Second, it would be useful to compare this online instruction more closely with the current training program by having trainees complete either the current training or the online instruction and then comparing their test scores. This comparison would provide a better understanding of how the two training methods compare for this subject, along with an understanding of the strengths and weaknesses of each method. This would involve working closely with the Shipyard's engineering training department to gain access to the current training program tests and test scores.

Lastly, similar research with other training topics besides the Ship Safety Manual could be conducted. Unfortunately, this goal is the most difficult to achieve because the classification of most of these topics prevents them from being published on a non-government platform like Canvas. If this were done, the instruction would require use of a different program to host the modules. The program would also require approval and clearance by the Shipyard's security department. While these goals may be challenging, it would be exciting to see if this or similar research can play an effective role in improving the training program at Pearl Harbor Naval Shipyard.

## References

- Bradley, J. (2010). Promoting and supporting authentic online conversations - which comes first - the tools or instructional design? *International Journal of Pedagogies & Learning*, 5(3), 20-31. Retrieved from <https://search-proquest-com.eres.library.manoa.hawaii.edu/docview/748076218?accountid=27140>
- Coveney, A.P., Switzer, T., Corrigan, M.A., & Redmond, H.P. (2013). Context dependent memory in two learning environments: The tutorial room and the operating theatre. *BMC Medical Education*, 13(1), 118. doi:10.1186/1472-6920-13-118
- Detsimas, N., Coffey, V., Sadiqi, Z., & Li, M. (2016). Workplace training and generic and technical skill development in the Australian construction industry. *The Journal of Management Development*, 35(4), 486-504. doi: 10.1108/JMD-05-2015-0073
- Dick, W., Carey, L., & Carey, J. O. (2009). *The systematic design of instruction*. Upper Saddle River, NJ: Pearson Education, Inc.
- Gagné, R. M., Wager, W. W., Golas, K. C., & Keller, J. M. (2005). *Principles of instructional design*. Belmont, CA: Wadsworth, Cengage Learning.
- Haley, C.K. (2008). Online workplace training in libraries, *Information Technology and Libraries*, 27(1), 33-40. Retrieved from: <http://search.proquest.com/openview/a40060bb32c44cf01b8be8198ec24772/1?pq-origsite=gscholar&cbl=37730>
- Naval Safety Center. (2008). *Guide to safety in availability*. Retrieved from <http://www.public.navy.mil/navsafecen/Documents/afloat/Surface/Admn/GUIDE%20TO%20SAFETY%20IN%20AN%20AVAILABILITY.pdf>
- Naval Sea Systems Command. (2009). *Industrial ship safety manual for submarines* (NAVSEA Technical Publication S9002-AK-CCM-010/6010).
- Nilson, C. (2007). *How to manage training: Facilitating workplace learning for high performance*. United States of America: American Management Association.
- Tsai, A. (2011). A hybrid e-learning model incorporating some of the principal learning. *Social Behavior & Personality: An International Journal*, 39(2), 145-152.
- United States Navy. (2017). Navy.mil Photo Gallery. Retrieved from: <http://www.navy.mil/viewGallery.asp>
- Vanderzanden, A.M. (2013). Asynchronous continuing education for Iowa's green industry professionals. *Horttechnology*, 23(5), 677-682.

## APPENDIX A

### Instruction Homepage

The homepage of the Canvas online instruction introduces learners to the course, tells them what they can expect from it, and provides instructions on how to proceed.

6010

Home


Modules

Quizzes

Discussions

Grades





## Ship Safety Training



This course provides an overview of the Ship Safety Manual\* (6010), Chapter 3 (Prevention and Control of Fire And Flooding).

To my coworkers: Thank you very much for volunteering your time to help me with this project!

You will be completing the course in the following order:

-  Pre-test
-  Modules
  - Para 3.1: General
  - Para 3.2: Ship in Dry Dock
  - Para 3.3: Ship Waterborne
-  Post-test
-  Instruction Evaluation (link to Google Form)

### Pre-test

The pre-test must be completed before you can access the modules. This will determine your knowledge level prior to starting this online course. You don't need to worry about studying the manual beforehand in order to get a good grade. Remember that your grade here will not impact your work.

### Modules

The modules must be completed before you can access the post-test. You can complete the modules in any order you like. Topics marked with a star (★) are very likely to be tested on. At the end of each module, there is a practice quiz and a discussion board. The practice quiz is for your own benefit in order to review the material just covered. The discussion board is meant to ask questions about the material, or post helpful tips, like mnemonics, for future users to see. It is not required. **When posting, please remember that this course is accessible to people outside of the shipyard.**

### Post-test

The post-test will be completed after the modules. This will determine your knowledge level after completing the online course. Please do not refer to the manual before or during this post-test. Remember that your grade here will not impact your work.

### Instruction Evaluation

The instruction evaluation should be completed after the post-test. This will be where you will answer questions about the current training and your thoughts on this online course, and you can also add any comments you may have. The link to this Google Form will become available after you have completed the post-test.

**TO START: please click on "Modules" in the left sidebar and proceed to the Pre-test.**

\*NAVSEA S9002-AK-CCM-010/6010, Industrial Ship Safety Manual for Submarines; APPROVED FOR PUBLIC RELEASE; DISTRIBUTION UNLIMITED

For more information about this course, please contact Lauren Wong at [lwong26@hawaii.edu](mailto:lwong26@hawaii.edu).

## APPENDIX B

### Module List

The list of modules links users to the different components of the instruction.

▼ Pre-test		Complete One Item	✓
🔗	Pre-test 25 pts   Submitted		✓
▼ Para 3.1: General		Prerequisites: Pre-test	Complete One Item ✓
📄	General Prevention and Control		
🔗	Para 3.1 Quiz 4 pts   Viewed		✓
💬	Para 3.1 Discussion		
▼ Para 3.2: Ship in Dry Dock		Prerequisites: Pre-test	Complete One Item ✓
📄	Dry Dock Conditions		
🔗	Para 3.2 Quiz 2 pts   Viewed		✓
💬	Para 3.2 Discussion		
▼ Para 3.3: Ship Waterborne		Prerequisites: Pre-test	Complete One Item ✓
📄	Video Clip: USS Guitarro		
📄	Hull Penetrations		
📄	Main Ballast Tanks and Sonar Dome		
📄	Ship Interior		
📄	Change of Trim, List, or Draft		
📄	Pumping Requirements		
📄	Safety Draft Markers		
📄	Drills		
🔗	Para 3.3 Quiz 7 pts   Viewed		✓
💬	Para 3.3 Discussion		
▼ Post-test		Prerequisites: Pre-test, Para 3.1: General, Para 3.2: Ship in Dry Dock, Para 3.3: Ship Waterborne	Complete One Item ✓
🔗	Post-test 30 pts   Submitted		✓
▼ Instruction Evaluation		Prerequisites: Post-test	
🔗	Evaluation Link (Google Form) ↗		

## APPENDIX C

### Module Page

The following are examples of content from the online modules.

#### Example 1:

##### Dry Dock Conditions

###### Dry Condition ★

Valves and other openings in the ship should be closed at the end of working hours whenever such closing is practicable. If this is impracticable, the dry dock, rather than the ship, should be protected from inadvertent flooding per reference (2).

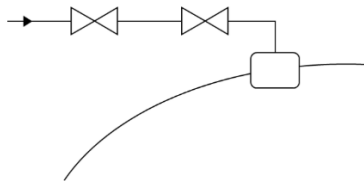
Any in-dock evolutions that could result in flooding from an uncontrolled constant fluid supply need to be controlled per the following requirements:

- Event must be authorized on the SPOD
- [Hull Penetrations](#) (below the waterline)
- [Pumping Requirements](#)

###### DEFINITION

Controlled constant fluid supply:

- The temporary supply has two in-line isolation valves, installed external to the hull, between the ship and the fluid source. The valves should be located to facilitate rapid isolation.



- The temporary supply and its operation should be transferred to Ship's Force, up to and including both off-hull isolation valves.
- Installation and removal of temporary supply should be controlled by a WAF.
- The ship's system receiving the fluid should be operational and tested to the temporary system's operating pressure.
- The installation of a temporary system external to the hull, outboard of the hull and backup valves, should have the hull joint testing to the temporary system's operating pressure.

###### Simulated Waterborne Conditions ★

The following items are required:

- Event is authorized on the SPOD.
- Hull openings, as listed on the SPOD, should follow the requirements under [Para 3.3: Ship Waterborne](#).
- Seawater valves should normally be operated using ship systems. Use of temporary systems requires SSC approval and should be listed on the SPOD.
- The ship has a pump with 200 GPM bilge pumping capabilities (ship's trim/drain or temporary pump(s)).

###### Waterborne Conditions

A ship in dry dock waterborne conditions should follow the requirements under [Para 3.3: Ship Waterborne](#).

###### References

(2) MIL-STD-1625, Safety Certification Program for Drydocking Facilities and Shipbuilding Ways for U.S. Navy Ships

#### Example 2:

##### Video Clip: USS Guitarro

Watch this short video (1:15) about why the USS Guitarro sank while moored.



The **shifts in weight** between forward and aft caused flooding, and the **inability to close hatches and watertight doors** kept them from controlling it. This section covers the requirements that are meant to prevent this from happening, among other guidelines to prevent and control flooding.

◀ Previous

Next ▶

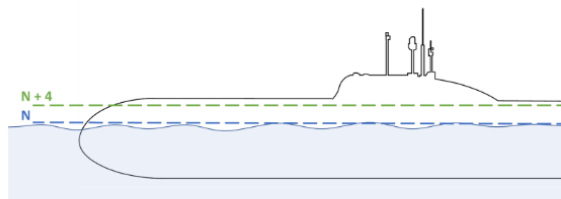
### Example 3:

## Hull Penetrations

The following will be separated into three sections:

1. Hull Penetrations Below the Waterline
2. Hull Penetrations/Openings from the Waterline to Four Feet Above the Waterline
3. Hull Penetrations/Openings Four Feet or More Above the Waterline

These different sections can be distinguished as shown here:

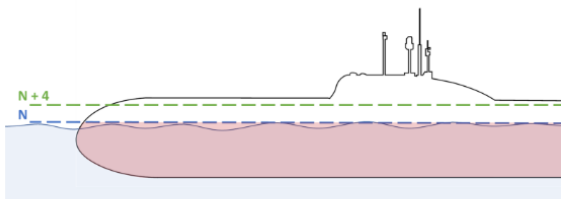


N: waterline

N+4: four feet above the waterline

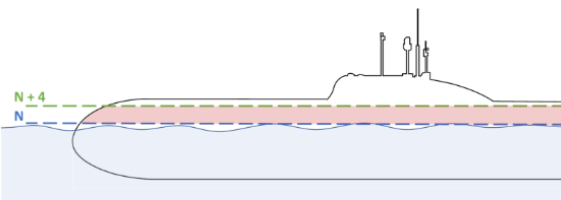
What's the waterline? ★
The "Condition N" Diving Trim waterplane as established by the reference trim dive immediately preceding entry into the Shipyard for overhaul or as established by a calculation of the maximum draft during availability, whichever is greater.

### Hull Penetrations Below the Waterline ★



These hull penetrations require **double barrier protection**. The only penetrations that are exempt from this rule are mechanical and electrical penetrations that are designed for single closure.

### Hull Penetrations/Openings from the Waterline to Four Feet Above the Waterline ★



All hull penetrations/openings between the N and N+4 lines that are not in their normal as-built condition (according to ship construction plans) should be listed on the SPOD with their authorized method of closure.

Hatches should be maintained so that they can be shut within 3 minutes of alarm initiation. If this isn't practical, then a cofferdam should be used to have the opening be above the N+4 line. Hull access openings also require cofferdams.

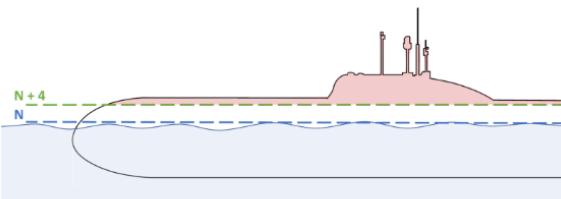
Cofferdams should maintain watertight integrity to at least the N+4 line. They should be attached to the hull to provide a positive seal. They should permit personnel access, temp services, and equipment shipping as applicable without violating its watertight integrity. They should be installed and tested before the ship becomes waterborne or within 72 hours after the ship arrives in the shipyard.

Hull penetrations don't need a cofferdam if it is adequately blanked or plugged while the system is under repair.

### Other

Penetrations and openings that do not meet the aforementioned criteria should be isolated with single closure. If this isn't practical, then it must be attended to at all times and the conditions must be approved on the SPOD.

### Hull Penetrations/Openings Four Feet or More Above the Waterline



These are not required to be watertight but should be protected from fluid entry with status maintained on the SPOD.

#### Example 4:

## Safety Draft Markers

Safety Draft Markers are used to easily show changes in trim, list, or draft that could affect ship safety.



#### ★ Requirements:

1. **Must be highly visible and placed on the hull fore and aft, both port and starboard.** The bottom edge of the mark should be **12 inches above the Maximum Calculated Draft (MCD)** that's specified on the Ship Plan of the Day (SPOD).
2. If the trim, list, or draft of the ship changes so that the distance between the bottom of the mark is **greater than 12 inches above the MCD**, the marks should be readjusted. The Ship Safety Council (SSC) should authorize the adjustment of the marks if there are any **scheduled evolutions that will place the mark in the water**.
3. The marks must be placed **prior to the ship becoming waterborne or within 72 hours after the implementation** of the Ship Safety Manual's requirements. The marks should not be removed **earlier than 72 hours before the scheduled Fast Cruise**.
4. The Safety Draft Marks should be located in the **vicinity of the ship's installed draft marks**.
5. **Draft readings need to be recorded** by the Ship Safety Watch (SSW) in the Ship Safety Log and compared with the pier side Safety Draft Marks.



## APPENDIX D

### Module Quiz

The following shows examples of the module quiz questions before and after the user submits the quiz.

#### Question 1:

Question 1

1 pts

Under simulated waterborne conditions, which of the following is a requirement?

- ☐ Seawater valves should normally be operated using ship systems
- ☐ Hull penetrations above the waterline in the normal as-built condition must be listed on the SPOD
- ☐ Seawater valves may not be operated using temporary systems
- ☐ The ship has a pump with 120 GPM bilge pumping capabilities

Question 1

0 / 1 pts

Under simulated waterborne conditions, which of the following is a requirement?

Correct Answer

☐ Seawater valves should normally be operated using ship systems

You Answered

☒ The ship has a pump with 120 GPM bilge pumping capabilities

The ship has a pump with 200 GPM bilge pumping capabilities (ship's trim/drain or temporary pump(s)).

☐ Seawater valves may not be operated using temporary systems

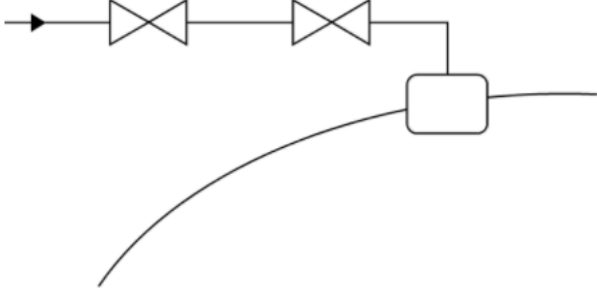
☐ Hull penetrations above the waterline in the normal as-built condition must be listed on the SPOD

## Question 2:

Question 2

1 pts

Is the following is a correct representation of a controlled constant fluid supply?



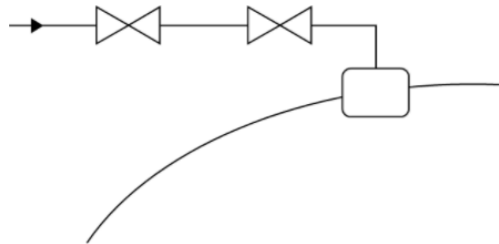
☐ True

☐ False

Question 2

1 / 1 pts

Is the following is a correct representation of a controlled constant fluid supply?



**Correct!** ☒ True

☐ False

## APPENDIX E

### Module Discussion Board

A discussion board was available to users at the end of each module to communicate with each other and the instructor.

**Para 3.1 Discussion**

Lauren Wong

✕

Ask or answer questions about this section here.

Unread
📄
📎

✓ Subscribe

↩ Reply

**Lauren Wong**

Feb 6, 2018

⋮

I got confused on Para 3.1 because I used intercompartimental isolation was the first step for this and I said it was building and building the system but it wasn't intercompartimental isolation.

👍

**Lauren Wong**

Feb 6, 2018

⋮

"You mean you selected the answer as "Isolate and secure the system" and it marked you incorrect?" Or are you saying the answer should be intercompartimental isolation?"

👍

↩ Reply

**Lauren Wong**

Feb 12, 2018

⋮

I got confused on Para 3.1 because I thought we could only have one answer. The second answer was two versions of "Isolate" so thinking that there is one answer. I chose the one that was two versions of Isolation.

👍 (1 like)

**Lauren Wong**

Feb 15, 2018


⋮

## APPENDIX F

### Pre-test and Post-test

The following shows examples of the pre-test and post-test questions before and after the user submits the tests.

Question 1:



**Question 1**1 pts

Alarm boxes are required in each compartment. They must be located no more than how many feet from any point in the compartment?

- ☐ 60
- ☐ 50
- ☐ 40
- ☐ 30

**Question 1**1 / 1 pts

Alarm boxes are required in each compartment. They must be located no more than how many feet from any point in the compartment?

- ☐ 30
- ☐ 40
- ☐ 60
- ☒ 50

**Correct!**

They must be located no more than 50 feet from any point in the compartment.



## Instruction Evaluation

If you have any questions or concerns, please contact Lauren Wong at [lwong26@hawaii.edu](mailto:lwong26@hawaii.edu) or [REDACTED]. Thank you!

1. First and last name \*

Your answer

2. How many years have you worked in Code 246? \*

- ☐ Less than 1 year
- ☐ 1-2 years
- ☐ 3-4 years
- ☐ 5-7 years
- ☐ 8-10 years
- ☐ More than 10 years

3. How do you feel about the current classroom training for shipyard engineers? \*

Hate it      1      2      3      4      5      Love it

4. What do you like about the current classroom training for shipyard engineers? \*

Your answer

---

5. What do you dislike about the current classroom training for shipyard engineers? \*

Your answer

6. Prior to completing this instruction, how confident were you in your knowledge of the Ship Safety Manual? \*

	1	2	3	4	5	
Not confident	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very confident

7. After completing this instruction, how confident were you in your knowledge of the Ship Safety Manual? \*

	1	2	3	4	5	
Not confident	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very confident

8. How would you compare this online instruction to the current classroom training? \*

	1	2	3	4	5	
Prefer current training	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Prefer online instruction

9. How would you rate the ease of use of the online platform Canvas? \*

	1	2	3	4	5	
Very difficult	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very easy

10. Please include any additional comments you have regarding the online instruction.

If you noticed any incorrect information in the instruction, please include the details here.

Your answer

---

PLEASE NOTE: By submitting this survey, you are agreeing that the data you have provided, including the test scores from the online instruction and in this survey, may be used in this research. Any identifiable data will only be viewed by the research team (myself and my faculty adviser), and any released data will be compiled and analyzed as a group to prevent identification. If you no longer wish to participate in this research, please do not submit this survey, and any data you have provided will no longer be used. Completion of this study will have no effect on your employment. \*

☐ I agree

SUBMIT



## APPENDIX H

### Recruitment Form

The following form was emailed to potential participants to recruit them for this research project.

## Recruitment form

The purpose of this survey is to recruit volunteers who would be willing to complete a pre-test, the online course, a post-test, and a short evaluation of the instruction at any time before Feb. 17, 2018, outside of working hours. This instruction will be covering a portion the Ship Safety manual on an online platform called Canvas. Completing the two tests, the online course, and evaluation should take no more than 60 minutes. The instruction and evaluation do not have to be completed in one sitting. Participants must have access to the internet and a personal computer. Your participation and results from this project will not have any impact on your work, and all results for this project will be compiled and analyzed as a group.

If you have any questions or concerns, please contact me, Lauren Wong, at [lwong26@hawaii.edu](mailto:lwong26@hawaii.edu). Thank you!

\* Required

Full name \*

Your answer

I am able to participate in completing the online instruction. \*

This will occur between Jan. 21, 2018 and Feb. 17, 2018.

☐ Yes

☐ No

Preferred email address \*

Additional correspondences will be made with this email. Enter "N/A" if you do not wish to participate.

Your answer

SUBMIT

## APPENDIX I

### Consent Form

The following consent form was emailed to participants. Participants were required to read this consent form to access the link to the online instruction.



**University of Hawai'i**  
**Consent to Participate in a Research Project**  
 Lauren Wong, Investigator

*Project title: Developing an Online Training on the Ship Safety Manual for Pearl Harbor Naval Shipyard*

Aloha! My name is Lauren Wong and you are invited to take part in a research study. I am a graduate student at the University of Hawai'i at Mānoa in the Department of Learning Design and Technology. As part of the requirements for earning my graduate degree, I am doing a research project. The purpose of my project will be to explore using an online instruction to teach the Ship Safety manual to engineers at Pearl Harbor Naval Shipyard. I am asking you to participate because you are a current Shipyard employee who is qualified in the Ship Safety manual.

**Project Description – Activities and Time Commitment:** If you decide to take part in this project, you will be asked to complete a pre-test, an online course, a post-test, and an instruction evaluation. The pre-test, online instruction, post-test, and evaluation should take no more than 60 minutes to complete. You will be able to complete these tasks over a period of four weeks. These tasks can be completed on your own time and do not have to be done in one sitting.

**Benefits and Risks:** There will be no direct benefit to you for taking part in this project. The results of this project will hopefully reveal the benefits of utilizing interactive technology for training at the shipyard. There is little risk to you for participating in this project.

**Confidentiality and Privacy:** Completing the online course will require you to provide your name. I will also be asking for your name in the instruction evaluation to connect your replies to your test scores. Any identifiable data will only be viewed by the research team (myself and my faculty adviser), and any released data will be compiled and analyzed as a group to prevent identification.

**Voluntary Participation:** You can freely choose to take part or to not take part in this survey. There will be no penalty or loss of benefits for either decision. If you do agree to participate, you can stop at any time.

**Questions:** If you have any questions about this study, please email me at [lwong26@hawaii.edu](mailto:lwong26@hawaii.edu) or [redacted]. You may also contact my advisor, Dr. Grace Lin, at [gracelin@hawaii.edu](mailto:gracelin@hawaii.edu). You may contact the UH Office of Research Compliance Human Studies Program at (808) 956-5007 or [uhirb@hawaii.edu](mailto:uhirb@hawaii.edu) to discuss problems, concerns and questions; obtain information; or offer input with an informed individual who is unaffiliated with the specific research protocol. Please visit <https://www.hawaii.edu/researchcompliance/information-research-participants> for more information on your rights as a research participant.

**To Access the Course:** Please go to the following web page: <https://canvas.instructure.com/enroll/8XB9RE>. You should find instructions for completing the course and subsequent instruction evaluation. Going to the online course and submitting the instruction evaluation will be considered as your consent to participate in this study.

Please print a copy of this page for your reference.

Mahalo!